

May 24, 1932.

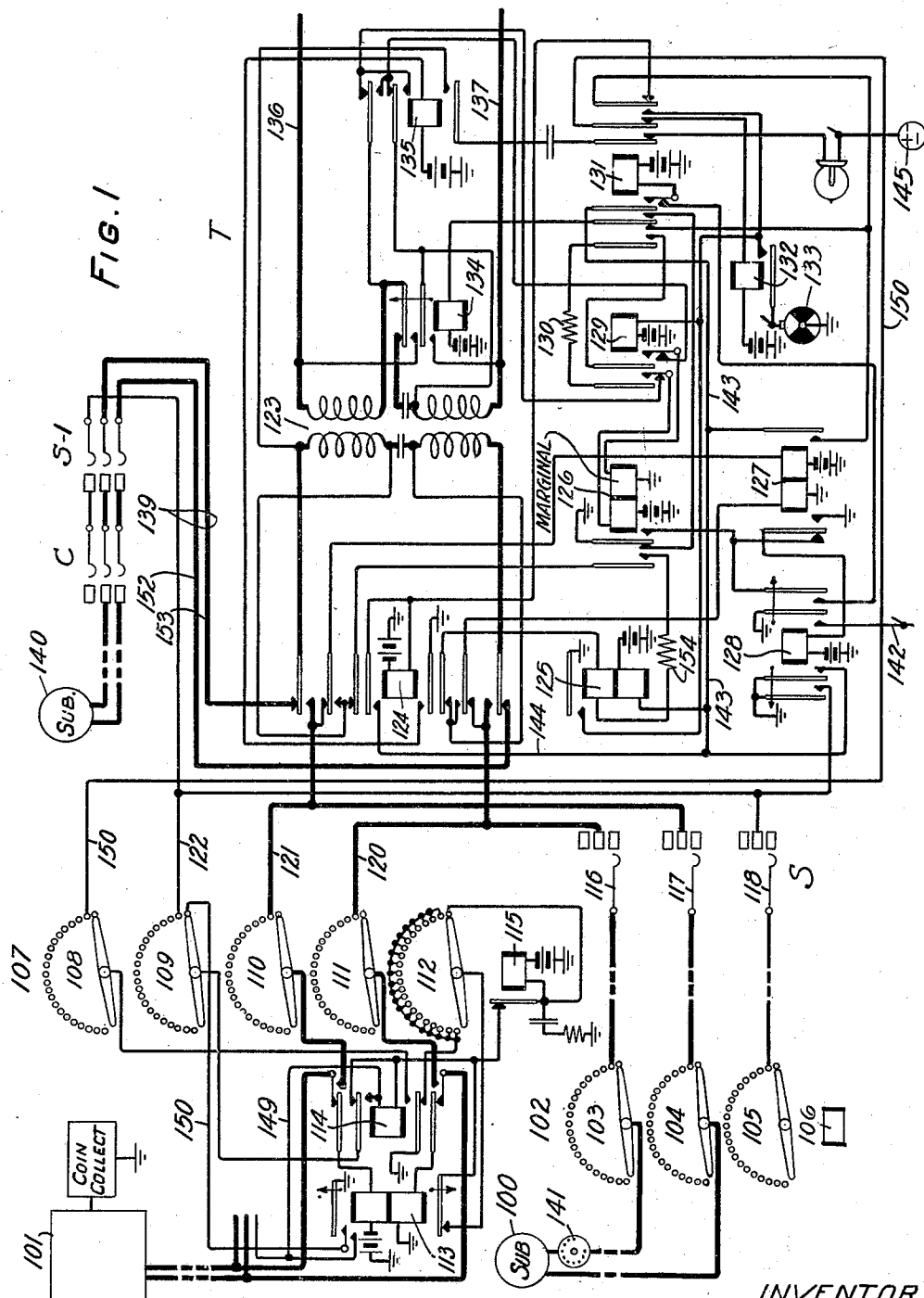
R. C. PAINE

1,859,885

TELEPHONE SYSTEM

Filed Feb. 24, 1930

2 Sheets-Sheet 1



INVENTOR
R. C. PAINE

BY *M. B. McKenney*
ATTORNEY

May 24, 1932.

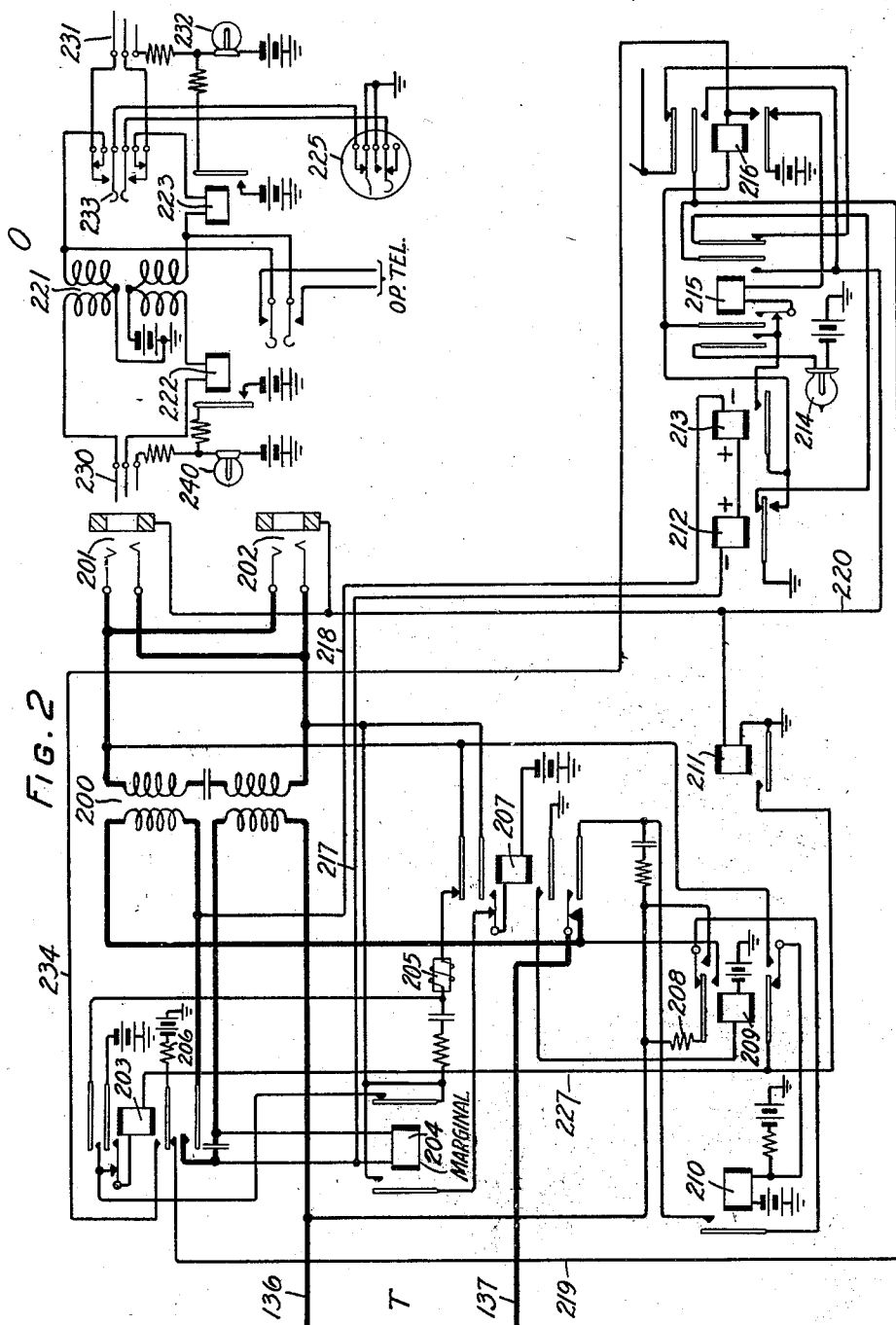
R. C. PAINE

1,859,885

TELEPHONE SYSTEM

Filed Feb. 24, 1930

2 Sheets-Sheet 2



INVENTOR
R.C. PAINE
BY *M. W. McJannet*
ATTORNEY

UNITED STATES PATENT OFFICE

ROBERT C. PAINE, OF BOONTON, NEW JERSEY, ASSIGNOR TO BELL TELEPHONE LABORATORIES, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

TELEPHONE SYSTEM

Application filed February 24, 1930. Serial No. 430,561.

This invention relates to telephone systems and particularly to trunking arrangements for extending connections from one station or office to a distant office.

5 The objects of the invention are to effect an economy in the use of equipment and especially in the use of interoffice trunks, to improve the efficiency of these trunks, to simplify the signaling equipment, and to otherwise improve systems of the character mentioned.

10 In systems involving different classes of lines, it has been the practice in the past to group or segregate lines according to classes in such a manner that calling lines of one class are extended to an operator's position over trunks of one group, whereas the calling lines of another class are extended to the same or another operator's position over trunks of a different group. In this way, the operator is aware of the class to which the calling line belongs and knows accordingly how to dispose of the call and what method to use in charging for the service.

20 In other instances, class-of-service information has been given the operator by means of distinctive signals, which inform her as to the nature of each calling line that is extended to her position. This is usually accomplished by providing the subscribers' lines with some identifying means which, when a call is made, so affects the circuits involved in extending the connection that one kind of signal is given the operator when a line of one class calls and another kind when a line of another class calls.

30 According to the present invention, an advantage is secured over these prior arrangements by means of a system in which calling lines of two different classes are extended to an operator's position over trunks of the same group, the lines of one class having access to said trunks directly through line switches and the lines of the other class having access to said trunks through one or more selector switches. The circuits are so arranged that the signal, which is given the operator, differs according to whether the trunk leading to her position is seized directly through a line switch or through a selector switch.

A feature of the invention is a system in which the discriminating signal received by the operator is effected by a signal device, such as a lamp which is lighted steadily under control of a circuit including the talking conductors of a two-wire interoffice trunk when the calling line is of a given class and which lights intermittently under control of the same circuit when the calling line is of another class.

55 According to a further feature, the interoffice trunk above described, over which different kinds of signals are sent to the operator, is a trunk of the two-way type by means of which calls are extended to the operator from different classes of lines and which may also be used by the operator for extending calls in the opposite direction.

60 In the drawings, Fig. 1 discloses a local or community office having a two-way trunk circuit which extends to an operator's position in a distant central office. This figure also shows subscribers' lines of different classes and switches for connecting said lines to the trunk circuit. It also diagrammatically illustrates selector and connector switches for completing incoming calls. Fig. 2 shows the other end of the two-way trunk circuit terminating at an operator's position in the central office.

70 In small communities where lines of different classes are involved such as flat rate lines and coin box lines, the traffic may be such that it is inefficient to provide separate trunk circuits to handle the calls from each of the different classes of lines. On the other hand, it is necessary to provide some way of advising the operator who receives the calls as to the class of the calling line. For instance, if the call is from a coin-box line she must know this and be able to supervise the deposit and disposition of the coins. In the present system, this requirement is accomplished by taking advantage of the fact that lines of different classes, although extended to the same operator's position over the same trunk circuit, must be connected to the outgoing end of the trunk circuit over different paths. The line 100, for instance, may be a flat rate line and is extended to the trunk circuit T over an ordinary rotary line switch

102 and through a directly operable selector switch S. In other words, the subscriber on initiating a call first causes the switch 102 to operate to extend the line to the selector S. He is then required to dial some digit such as the digit 0 to cause the selector S to seize the outgoing end of the trunk circuit T. Seizure of the trunk T will cause a trunk lamp 214 at the distant manual operator's position to light steadily, advising the operator that a call is awaiting on the trunk T and that the calling line is one of the flat-rate class. Again if a coin line 101 initiates a call, the line is extended over a line switch 107 directly to the outgoing end of the trunk T without requiring any further action on the part of the calling subscriber. In this case, however, the line switch 107 is arranged to affect the trunk circuit T in such a manner that the trunk signal 214 at the operator's position will be flashed to advise her that the call awaiting her attention is one from a coin-box line.

For calls incoming to the community office from the central office, trunk circuit T is so arranged that the operator can seize the trunk at the central office and transmit dial impulses to the community office, causing the setting of selector and connector switches such as the switches S—1 and C to complete the connection to a desired subscriber's line 140.

A detailed description will now be given, and, for this purpose, it will first be assumed that the subscriber of line 100 desires to make a central office call. In response to the initiation of the call, switch 102 operates to extend the line over brushes 103, 104, and 105 to the selector switch S. The subscriber thereupon manipulates his dial 141 to send a series of impulses to the selector switch S, causing it to position its brushes 116, 117, and 118 on the terminals of the trunk circuit T.

As soon as the trunk is seized, relay 127 operates in a circuit from battery through its right winding, next to the outer upper armature and back contact of relay 124, conductor 121, brush 117, brush 104, thence over the loop of the line 100 and returning through the brushes 103 and 116, conductor 120, next to the lowermost armature and back contact of relay 124, left winding of relay 127 to ground. Relay 127 closes an obvious operating circuit for the slow-release relay 128. Relay 128 applies ground potential to the sleeve conductor 122, rendering the trunk busy to other switches and also serving to hold the switches 102 and S. Relay 128 at its inner right contact applies ground potential over conductor 142 for starting the ringing machine (not shown), which may also serve to drive the interrupter 133. Relay 128 also causes the operation of relay 124 in a circuit from battery through the winding of the latter relay, outer right back contact

of relay 131, right contact of relay 127, conductor 143 to ground at the inner left contact of relay 128. Relay 124 locks to the grounded conductor 144. Slow-release relay 134 is also operated in a circuit through its winding, middle left armature and back contact of relay 131, right contact of relay 127 to the grounded conductor 143. Relay 124 shifts the circuit of relay 127 so that it now extends from battery through the right winding of relay 127 next to the uppermost armature and front contact of relay 124, upper left winding of repeating coil 123, uppermost armature and front contact of relay 124, thence over the subscriber's line and returning through the lowermost armature and front contact of relay 124, lower left winding of the coil 123, next to the lowermost armature and front contact of relay 124 to ground through the left winding of relay 127. The difference is that the circuit now includes the left windings of the repeating coil 123. Relay 124 at its uppermost and lowermost armatures disconnects the trunk circuit T from the branch 139 leading to the selector switch S—1. Relay 124 also causes the operation of relay 135 in a circuit from battery through the winding of the latter relay to ground through the inner lower armature and contact of relay 124. Relay 135 at its lower armature connects the source 145 to the repeating coil 123 to furnish a tone current in the calling subscriber's line. Relay 135 also reverses the direction of current flow over the trunk circuit T to the distant manual office.

It may be well to note at this point that the trunk circuit T is so arranged that current of a low value normally flows through the windings of the relay 126 at the local office over the two-wire trunk circuit T to the manual office and through a bridge circuit of high resistance thereat. The circuit for this purpose may be traced from battery through the left winding of relay 126, outer normal contact of relay 129, uppermost normal contact of relay 135, upper right winding of coil 123, conductor 136, thence to the distant central office through the lower left winding of repeating coil 200, winding of relay 204, conductor 217, through the windings of the high resistance polarized relays 212 and 213, conductor 218, upper left winding of coil 200, lower normal contact of relay 207, conductor 137, through the lower right winding of coil 123, inner upper normal contact of relay 135, inner normal contact of relay 129 to ground through the right winding of relay 126. The relays 212 and 213 are so polarized that relay 212 is normally operated, whereas the relay 213 normally has its armature retracted. Relay 126 at the local office is marginal and will not operate in response to the small amount of current flowing due to the high resistance of relays 212 and 213. Relay 204 at the central office also

normally remains inert due to the high resistance of relays 212 and 213.

When, therefore, the slow-release relay 134 operates as above explained, the trunk circuit is modified to exclude the right windings of the repeating coil 123 to improve the operating characteristics. Following the operation of relay 134, the circuit may be traced from battery through the left winding of relay 126, outer normal contact of relay 129, upper normal contact of relay 135, upper front contact of relay 134, thence over the conductor 136 and returning over conductor 137 through the inner front contact of relay 134, inner normal contact of relay 135 and thence through the right winding of the relay 126. When later the relay 135 operates, as explained, it reverses the direction of current flow from the windings of relay 126 over the conductors 136 and 137.

The reversal of current over the trunk circuit causes the relay 212 to release and the relay 213 to operate. A circuit is now completed from ground through the back contact of relay 212, contact of relay 213, normal contacts and winding of relay 215 to battery through the lower back contact of relay 216. Relay 215 operates and locks through its winding and inner left front contact to ground at the back contact of relay 212. Relay 215 completes a circuit for the lamp 214 traceable from battery through said lamp, outer left contact of relay 215, contacts of relays 213 and 212 to ground. The lamp lights steadily in this circuit to advise the operator that a call is awaiting on the trunk circuit T and that the calling line is of a given class. Relay 215 also closes a circuit from battery through the resistance 206, inner lower back contact of relay 203, conductor 219, inner right contact of relay 215, conductor 220, winding of the sleeve relay 211 to ground. Relay 211 operates and causes the operation of relay 210 in a circuit from ground to the contact of relay 211, lower normal contact of relay 209, winding of relay 210 to battery.

The operator at position 0 sees the lamp lighted and answers the call by inserting the answering plug 230 in the jack 201. It will be noted that trunk T appears in two jacks 201 and 202. This double appearance is to enable the operator to determine the nature of the calling line after having set up the connection. The jack 201 indicates that calling line is of the flat-rate class, whereas the jack 202 identifies calling lines of the coin-box class. The insertion of the plug 230 in the jack 201 causes the operation of relay 203 in a circuit from battery through the lower left winding of repeating coil 221, winding of supervisory relay 222, ring of the plug and jack, right contact of relay 204, normal contact and winding of relay 203, conductor 227 to ground at the contact of relay 211. Relay 203 locks through its inner upper contacts to

the grounded conductor 227. Relay 203 shunts the relays 212 and 213 over a path extending from the conductor 136, lower left winding of coil 200, winding of relay 204, lowermost contact of relay 203, upper left winding of coil 200, lower normal contacts of relay 207 to the conductor 137. Relay 213 now releases and opens the circuit of the lamp 214. Relay 203 also disconnects battery from the lead 219. Relay 211 is now held over the sleeve of the plug and jack to battery in the cord circuit. Relay 203 in operating causes the operation of relay 216 in a circuit from battery through the resistance 206, inner lower front contact of relay 203, conductor 234, winding of relay 216 to ground at the back contact of relay 212. Relay 216 operates and locks to ground at the back contact of relay 212. Relay 216 releases the relay 215.

Relay 204 when freed from the resistance of relays 212 and 213 operates in series with the relay 126 at the local office. Relay 204 at its right contact opens a bridge which would otherwise exist across the tip and ring conductors of the trunk circuit on the right hand side of the repeating coil 200.

When the resistance of relays 212 and 213 is removed at the central office, as above described, relay 126 at the local office operates and completes a circuit from ground through its inner front contact, outer right contact of relay 128, inner left normal contact of relay 131 to battery. Relay 131 operates and locks through its inner left front contact, conductor 143 to ground at the inner left contact of relay 128. Relay 131 disconnects the tone source 145 and closes an operating circuit for relay 129. This circuit may be traced from battery to the winding of relay 129, outer right front contact of relay 131, right contact of relay 127 to the grounded conductor 143. Relay 129 in operating disconnects the windings of relay 126 from the tip and ring conductors of the trunk circuit T and connects them instead through the resistance 130. This holds the relay 126 operated and permits relay 204 at the central office to release. Relay 131 also causes the release of relay 134 to remove the shunt from the right windings of repeating coil 123. The operator having completed the connection to the called line with the calling jack 231 conversation will now take place.

Relay 204 at the central office in releasing completes a circuit from battery through the lower left winding of the coil 221 in the operator's cord circuit, winding of the relay 222, ring of the plug 230 and jack 201, right contact of relay 204, uppermost front contact of relay 203, coil 205, uppermost contact of relay 207 through the tip of the jack and plug and the upper left winding of coil 221 to ground. Relay 222 operates and shunts the supervisory lamp 240, causing it to extinguish.

Should the calling subscriber wish to attract the attention of the operator, he may do so by repeatedly operating his switch-hook. This causes the relay 127 to release and reoperate, in turn causing the repeated operation and release of relay 129. Each time relay 129 releases, the relay 204 at the central office operates and opens the bridge across the trunk circuit, causing the release of the supervisory relay 222 and the lighting of the lamp 240.

After conversation has been completed, the calling subscriber replaces his receiver, causing the release of relay 127. Relay 128, however, is held by means of a circuit from battery through its winding, left armature and back contact of relay 127 to ground at the inner left front contact of relay 126. Relay 127 releases relay 129, which reconnects the windings of relay 126 to the trunk circuit. This causes the operation of relay 204, which opens the circuit of relay 222, causing the supervisory signal 240 to illuminate. As soon as the operator removes the plug 230 from the jack 201, relay 211 releases and in turn releases relay 203. As soon as relay 203 fully releases, it reoperates relay 211 in a circuit from battery over the conductor 219, inner upper contact of relay 216, winding of relay 211 to ground. Relay 203 removes the shunt around the windings of relays 212 and 213, whereupon relay 204 at the central office and relay 126 at the local office are released.

When relay 126 releases, it opens the circuit of slow-release relay 128, which after an interval retracts its armatures. Relay 128 opens the holding circuits of relays 131 and 124, and these relays release. Relay 124 in turn releases relay 135, which restores the flow of current over the trunk circuit to its normal direction. When the flow of current is restored to its normal direction, relay 212 attracts its armature and relay 213 releases its armature. Relay 212 on attracting its armature opens the holding circuit of relay 216, and this relay releases.

At the local office, the removal of ground potential from the sleeve conductor 122 causes the release of the selector S and the restoration of the system to its normal condition.

It will next be assumed that the calling party at the coin-box station 101 wishes to make a central office call. He initiates the call by removing his receiver from the switch-hook, whereupon a circuit is completed from battery through the upper winding of relay 113, uppermost normal contact of relay 114, thence over the loop of the calling line and returning through the lowermost normal contact of relay 114 and the lower winding of relay 113 to ground. Relay 113 at its uppermost contact places ground potential on the sleeve conductor 149 to render the line

busy to connector switches. Relay 113 also completes a circuit from ground through its uppermost contact, conductor 150, brush 109 on its No. 1 contact, inner upper back contact of relay 114, contact and winding of the stepping magnet 115 to battery. The magnet 115 interrupts its own circuit and steps the brushes 108, 109, 110, 111 and 112 to the next set of terminals. If the trunk appearing in these terminals is busy, the magnet 115 advances the brushes another step, and this procedure continues until the brush 109 reaches an ungrounded terminal representing an idle trunk circuit T. When this occurs the relay 114 operates in a circuit from battery through the winding and contact of magnet 115, the winding of relay 114, conductor 149 to ground at the upper contact of relay 113. Although this circuit has existed during the stepping of the switch 107, the cut-off relay 114 has been shunted so long as the wiper 109 encounters busy test contacts. Due to the high resistance of the cut-off relay 114, the magnet 115 does not operate in series therewith. Relay 114 immediately applies ground potential to the test conductor 122 by means of the circuit from ground, upper contacts 113, conductor 149, inner upper front contact of relay 114 and brush 109. Relay 114 opens the circuit of relay 113, but this relay is slow to release; therefore, it does not immediately retract its armatures.

As soon as relay 114 operates, it extends the tip and ring conductors of the line through to the tip and ring conductors of the trunk circuit T, and relay 127 operates in the manner hereinbefore described. Relay 127 operates relay 128, which returns a ground potential over the conductor 122 and the brush 109 to hold relay 114 operated when relay 113 subsequently releases. A circuit is now completed for operating the relay 132, which serves to cause the flashing of lamp 214 at the operator's position to advise her that the call originated on a coin-box line. The circuit for relay 132 may be traced from battery through the winding thereof, middle right contact of relay 131, conductor 150, brush 108 to ground at the inner lower contact of relay 114. Relay 132 closes a circuit from ground through the interrupter 133, contact of said relay through the winding of relay 129 to battery. The interrupter 133 causes the relay 129 to repeatedly operate and release. This repeatedly disconnects the windings of relay 126 from the trunk circuit, causing the repeated operation and release of the polarized relay 213 and the flashing of the lamp 214. The operator observing the flashing lamp knows that the call has originated on a coin-box line; accordingly she answers by inserting the answering plug 230 in the jack 202 of the trunk. From this point on, the completion of the connection is the same as already described in detail. The subsequent opera-

tion of relay 131 releases relay 132, which disconnects the interrupter 133.

It will next be assumed that a subscriber in the central office wishes to obtain connection with a line in the local office, such as the subscriber's line 140. The operator receives the call from the calling subscriber and extends the connection by inserting her calling plug 231 into the jack of the trunk circuit T.

Thereupon relay 211 is operated in a circuit from battery through the lamp 232 over the sleeve of the plug and jack and conductor 220 through the winding of relay 211 to ground. Relay 211 operates the relay 210 in an obvious circuit. Relay 203 also operates in a circuit from ground over conductor 227 through the winding and normal contact of relay 203 right contact of relay 204, over the ring of the jack and plug, lower normal contacts of dialing key 233, winding of the relay 223, lower right winding of coil 221 to battery. Relay 203 locks through its own contact under control of relay 211. Relay 203 shunts the relays 212, and 213 as hereinbefore explained, causing relay 212 to release and permitting relay 204 to operate in series with the windings of relay 126 at the distant local office. With relay 212 released and relay 203 operated, relay 216 operates as above explained. Relay 216 locks through its own contact to the contact of relay 212.

When the operator is ready to transmit impulses, she throws the dial key 233, which connects the impulse dial 225 to the calling end of her cord circuit. As soon as the dial 225 is moved off normal the lower contacts are closed, and relay 207 now operates in a circuit from battery through its winding and normal contact, left contact of relay 204, through the ring of the jack and plug, lower closed contacts of key 233, off-normal contacts of the dial 225 to ground. Relay 207 locks through its own contacts to the off-normal contacts of the dial 225. Relay 207

modifies the circuit incoming from the local office so that it may now be traced over the conductor 136, resistance 208, upper back contact of relay 209, contact of relay 210, lowermost front contact of relay 207 to conductor 137. This bridge across the trunk T shunts the relay 204, and said relay releases. Relay 207 also operates relay 209 in an obvious circuit. Relay 209 again modifies the circuit incoming from the local office so that it now excludes the resistance 208. The pulsing relay 210, which up to this time has been held by the relay 211, is now energized in a circuit from battery through its winding, lower front contacts of relay 209, thence over the tip of the jack and plug, upper closed contacts of key 233 through the impulse contacts of the dial 225 to ground. As the dial restores to normal, the pulse relay 210 releases and operates repeatedly, in turn opening and closing the bridge across the con-

ductors 136 and 137 extending to the distant office.

At the time the trunk is seized by the operator and relay 204 operates to shunt the resistance of the polarized relays 212 and 213, relay 126 at the local office energizes and closes the circuit above traced for the slow-release relay 128. Relay 128 at its inner left contact energizes the lower winding of the electro-polarized relay 125. This relay, however, does not operate. With relays 126 and 128 operated, a circuit is closed from battery through the winding of relay 131, normal contacts of the latter relay, outer right contact of relay 128, inner left contact of relay 126 to ground. Relay 131 operates and locks to the grounded conductor 143. Relay 126 also completes a loop circuit extending over the branch 139 to the first selector switch S—1. This may be traced from conductor 152, lowermost back contact of relay 124, lower left winding of coil 123, next to the inner lower back contact of relay 124, upper winding of the electro-polarized relay 125, resistance 154, outer contact of relay 126, next to the inner upper back contact of relay 124, upper left winding of coil 123, uppermost back contact of relay 124 to conductor 153. This circuit serves to energize the usual impulse relay at the selector switch S—1. Due to the direction of current flow, however, the relay 125 will not operate. When the first impulse is received from the central office, relay 126 releases and closes a circuit from ground through its inner left back contact, middle left contact of relay 131, winding of relay 134 to battery. Relay 134 operates and excludes the right windings of the coil 123 from the pulse circuit during dialing. At its outer contacts, relay 126 repeats the impulse to the selector switch S—1. The succeeding impulses are also repeated, and the switches S—1 and C are operated to extend the connection to the called line 140.

Each time the dial returns to normal, relays 207 and 209 release, whereupon relay 204 reoperates. As soon, however, as the dial is again moved away from normal on the succeeding operation, relays 207 and 209 reoperate and relay 204 again releases. After dialing has been completed, the operator restores the key 233 to disconnect the dial from the cord circuit. Relay 204 now reoperates and remains operated.

When the called subscriber answers, current is reversed in the branch 139 in the usual manner, and relay 125 operates. Relay 125 closes an obvious circuit for relay 129. Relay 129 operates and disconnects battery and ground from the trunk circuit and holds the relay 126 from releasing. The removal of battery and ground from the trunk circuit causes the release of relay 204. Relay 204 closes a circuit for the supervisory relay 223 extending from battery through the coil 221,

relay 223, thence over the ring of the plug and jack, right contact of relay 204, upper front contact of relay 203, coil 205, upper back contact of relay 207 over the tip of the jack and plug to ground at the coil 221. Relay 223 extinguishes the lamp 232, advising the operator that the subscriber has answered.

After conversation has been completed and the called subscriber replaces his receiver, current is reversed in the circuit 139, and relay 125 releases. Relay 125 releases relay 126, which reconnects the relay 126 to the trunk T, causing relay 204 to operate. Relay 204 opens the circuit of relay 223 and the supervisory lamp 232 again illuminates as a signal to disconnect. When the operator removes the plug from the jack, the relay 126 is released as above explained, causing the release of relays 128 and 131.

What is claimed is:

1. In a telephone system, lines of different classes, a trunk circuit consisting of two conductors, non-numerical switches for connecting lines of one class directly to said trunk, numerically operated switches for connecting lines of another class to said trunk, and means controlled over said trunk for giving different kinds of signals according to the class of line connected to the trunk.

2. In a telephone system, a local station, lines of different classes terminating in said station, a distant station, a trunk interconnecting said stations, non-numerical switches for connecting the lines of one class directly to said trunk, directly operable switches for connecting lines of another class to said trunk, a single signal for said trunk at the distant station, and means at the local station effective according to the class of the lines connected to said trunk for controlling said signal to give distinctive indications.

3. In a telephone system, a local station and a distant station, lines of different classes terminating in said local station, a trunk interconnecting said stations, switches operative responsive to the initiation of calls on lines of a certain class for connecting said lines directly to said trunk at the local station, switches controlled directly over the lines of another class for connecting such other lines to said trunk, a signal for the trunk at the distant station, and means for operating said signal in a distinctive manner according to whether a calling line is connected to the trunk automatically or directly.

4. In a telephone system, a local station, a distant office, a trunk interconnecting said local station and distant office, lines of different classes, a signal associated with the trunk at the distant office, non-numerical switches for connecting the lines of one class directly to said trunk at the local station, directly operable switches for connecting lines of another class to said trunk at the

local station, a signal circuit including the talking conductors of said trunk, and means at the local station for controlling said circuit in different ways according to the class of the calling lines for causing said signal at the distant office to give distinctive indications.

5. In a telephone system, a first station, lines of different character thereat, a second station, a trunk interconnecting said stations, means responsive to the initiation of a call on a line of one character for connecting said line directly to said trunk at the first station, means controllable directly over a calling line of another character for connecting such line to said trunk, a signal associated with said trunk at the second station, a signal circuit including the talking conductors of said trunk, and means at the first station rendered effective when a line of a certain class calls for successively interrupting said signal circuit to cause the intermittent operation of the signal at the distant end of the trunk.

6. In a telephone system, lines of different classes, a trunk, non-numerical switches for connecting the lines of one class directly to one end of said trunk, numerical switches for connecting the lines of another class to said end of said trunk, a signal associated with the other end of said trunk, a signal circuit including the talking conductors of said trunk, means responsive to the extension of a connection through a numerical switch for closing said signal circuit to cause such signal to operate steadily, and means responsive to the extension of a connection through a non-numerical switch for repeatedly interrupting said signal circuit to cause the signal to operate intermittently.

7. In a telephone system, a trunk line, two telephone lines each of a different class, a line switch for connecting one line directly to said trunk, a line switch and a selector switch for connecting the other line to said trunk, a single signal associated with said trunk, means responsive to a connection through the line switch to said trunk for causing the operation of said signal in a distinctive manner, and means responsive to a connection through a line switch and a selector switch for causing the operation of said signal in a different manner.

8. In a telephone system, a coin-controlled line, a flat-rate line, a trunk circuit, a non-numerical switch for connecting said coin-controlled line directly to one end of said trunk circuit, a selector switch controlled over said flat-rate line for connecting such line to the same end of said trunk circuit, a single signal at the other end of said trunk circuit, and means controlled over said trunk for operating said signal distinctively according to which line is connected to the trunk.

9. In a telephone system, a local office, lines of different character terminating therein, a central office having a manual operator's position therein, a plurality of trunks interconnecting said offices, signal lamps at said position, one for each of said trunks, non-numerical switches for connecting the lines of one class directly to said trunks at the local office, directly operable switches for selectively connecting the lines of another class to said trunks at the local office, and means controlled over said trunks in accordance with the class of the lines connected thereto at the local office for operating the said signals in a distinctive manner.

10. In a telephone system, a local office, lines of different classes terminating therein, a distant office, a two-conductor trunk interconnecting said offices, non-numerical switches for connecting the lines of one class directly to said trunk at the local office, directly operable switches for connecting the lines of another class to said trunk at the local office, a signal for said trunk at the distant office, and means controlled over said trunk in accordance with the class of the line connected thereto for operating said signal in a distinctive manner.

11. In a telephone system, a first office, lines of different classes terminating in said office, a second office, a trunk interconnecting said offices, non-numerical switches for connecting the lines of one class to said trunk at the first office, directly operable selector switches for connecting the lines of another class to said trunk at the first office, a signal at the second office, means controlled over the trunk according to the class of line connected thereto at the first office for operating said signal in a distinctive manner, and means at the second office for extending a connection over said trunk to the first office.

12. In a telephone system, a local office, two telephone lines terminating therein, a distant office, a trunk interconnecting said offices, a line switch for connecting one of said lines directly to said trunk at the local office, a directly operable switch for connecting the other line to said trunk at the local office, means at the distant office for extending a connection originating at the local office in the direction of a called line, a signal at the distant office, means dependent upon which line is connected to the trunk at the local office for operating said signal in a distinctive manner, an automatic switch at the local office, and means at said second office for operating said automatic switch over said trunk to extend a connection from the distant office in the direction of a called line in said local office.

In witness whereof, I hereunto subscribe my name this 14th day of February, 1930.

ROBERT C. PAINE.